

WHAT IS CLAIMED :

1. A liquid crystal display device having a first substrate, a second substrate, and a liquid crystal layer between the first substrate and the second substrate, the liquid crystal display device comprising:

a first electrode provided on the first substrate; and

a second electrode provided on the second substrate so as to face the first electrode via the liquid crystal layer,

the liquid crystal layer being vertically aligned when no voltage is applied across the first electrode and the second electrode, and

the liquid crystal layer having a twisted structure and being aligned parallel to the substrates when a voltage is applied across the first electrode and the second electrode,

said liquid crystal display device having a defined value for d/p between $0.0021 \times (V_{\max})^2 - 0.0458 \times (V_{\max}) + 0.65$ and $0.0021 \times (V_{\max})^2 - 0.0458 \times (V_{\max}) + 0.50$, and

said liquid crystal display device having a defined value for $d \cdot \Delta n / \lambda$ between $-0.00026 \times (V_{\max})^3 + 0.016 \times (V_{\max})^2 - 0.2281 \times (V_{\max}) + 2.124$ and $-0.00026 \times (V_{\max})^3 + 0.016 \times (V_{\max})^2 - 0.2281 \times (V_{\max}) + 1.7603$,

where d/p is a ratio of a thickness d of the liquid crystal layer to a natural twist pitch p of a liquid crystal,

V_{\max} [V] is a maximum applied effective voltage across the first electrode and the second electrode, and Δn is a refractive anisotropy of the liquid crystal layer.

2. The liquid crystal display device as set forth in claim 1, wherein:

the defined value of $d \cdot \Delta n / \lambda$ is between $-0.00026 \times (V_{\max})^3 + 0.016 \times (V_{\max})^2 - 0.2281 \times (V_{\max}) + 2.041$ and $-0.00026 \times (V_{\max})^3 + 0.016 \times (V_{\max})^2 - 0.2281 \times (V_{\max}) + 1.891$.

3. The liquid crystal display device as set forth in claim 1, wherein:

the defined value of d/p is between $0.0021 \times (V_{\max})^2 - 0.0458 \times (V_{\max}) + 0.63$ and $0.0021 \times (V_{\max})^2 - 0.0458 \times (V_{\max}) + 0.53$.

4. The liquid crystal display device as set forth in claim 1, wherein:

the liquid crystal layer includes a picture element region defined by the first electrode and the second electrode; and

the picture element region includes at least one liquid crystal domain in which liquid crystal molecules under applied voltage are aligned radially or in an axially

symmetrical manner.

5. The liquid crystal display device as set forth in claim 1, wherein:

the liquid crystal layer includes one or more picture element regions defined by the first electrode and the second electrode; and

the first electrode has a portion that corresponds to the picture element region and in which one or more openings are formed, the opening and a solid section, which is a portion of the first electrode other than the opening, each having a liquid crystal domain in which alignment directions of liquid crystal molecules are controlled by an inclined electric field generated from edge portions of the opening when a voltage is applied across the first electrode and the second electrode.

6. The liquid crystal display device as set forth in claim 5, wherein:

a plurality of the openings are provided in each of the picture element regions; and

the liquid crystal domain is formed for (i) each of the openings and for (ii) each of one or more unit solid sections, which is a portion of the solid section surrounded by the openings.

7. The liquid crystal display device as set forth in claim 6, wherein:

the openings are substantially identical with one another in shape and size, and each of the openings forms a unit lattice arranged to have rotational symmetry.

8. The liquid crystal display device as set forth in claim 6, wherein:

at least one of the openings has a rotationally symmetrical shape.

9. The liquid crystal display device as set forth in claim 6, wherein:

at least one of the openings has a substantially circular shape.

10. The liquid crystal display device as set forth in claim 6, wherein:

at least one of a plurality of the unit solid sections has a substantially circular shape.

11. The liquid crystal display device as set forth in claim 6, wherein:

at least one of a plurality of the unit solid sections

has a substantially rectangular shape with substantially arc-shaped corners.

12. The liquid crystal display device as set forth in claim 6, wherein:

a sum of areas of the openings in the picture element region is smaller than an area of the solid section.

13. The liquid crystal display device as set forth in claim 1, wherein:

the liquid crystal layer has a dielectric anisotropy $\Delta\epsilon$ of from -2.5 to -6.5, and has an elastic constant ratio K_{11}/K_{33} of from 0.9 to 2.0.

14. The liquid crystal display device as set forth in claim 1, wherein:

the first electrode comprises a plurality of picture element electrodes that respectively correspond to a plurality of the picture element regions; and

the first substrate includes an active element that is provided for each of the picture element regions so as to switch the first electrode.